

UNFUNDED SPACE ACT AGREEMENT
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AND GLOYER-TAYLOR LABORATORIES, LLC
UNDER THE SPACE TECHNOLOGY
ANNOUNCEMENT OF COLLABORATION OPPORTUNITY 2020

ARTICLE 1. AUTHORITY AND PARTIES

In accordance with the National Aeronautics and Space Act (51 U.S.C. § 20113(e)), this Agreement is entered into by the National Aeronautics and Space Administration, located at 300 E Street SW, Washington, DC 20546 (hereinafter referred to as "NASA") and Gloyer-Taylor Laboratories, LLC located at 112 Mitchell Blvd, Tullahoma, TN 37388 (hereinafter referred to as "Partner" or "GTL"). NASA and Partner may be individually referred to as a "Party" and collectively referred to as the "Parties."

ARTICLE 2. PURPOSE

This Agreement ("Agreement") shall be for the purpose of accelerating the development and testing of critical technologies for emerging space system capabilities consistent with the capabilities articulated in the STMD 2020 Announcement of Collaboration Opportunity (ACO). "The Parties' specific responsibilities, schedule, and milestones are described in one or more Responsibilities and Schedule document completed in coordination with a NASA Center and incorporated fully by reference into this Agreement. This collaboration is intended to advance commercial space-related efforts by facilitating access by Partner to NASA's extensive resources including facilities, technical expertise, hardware, and software. Each Center Responsibilities and Schedule Document will detail the specific purpose of the proposed activity, responsibilities, schedule and milestones, and any personnel, property or facilities proposed to be made available to Partner.

ARTICLE 3. RESPONSIBILITIES

The Parties agree they will use reasonable efforts to fulfill the Responsibilities set forth in any Schedule and Responsibilities Document.

ARTICLE 4. SCHEDULE

The Parties agree they will use reasonable efforts to meet the Schedule set forth in any Schedule and Responsibilities Document.

ARTICLE 5. FINANCIAL OBLIGATIONS

There will be no transfer of funds between the Parties under this Agreement and each Party will fund its own participation. All activities under or pursuant to this Agreement are subject to the availability of funds, and no provision of this Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act (31 U.S.C. § 1341).

ARTICLE 6. PRIORITY OF USE

Any schedule or milestone in this Agreement is estimated based upon the Parties' current understanding of the projected availability of NASA goods, services, facilities, or equipment. In the event that NASA's projected availability changes, Partner shall be given reasonable notice of that change, so that the schedule and milestones may be adjusted accordingly. The Parties agree that NASA's use of the goods, services, facilities, or equipment shall have priority over the use planned in this Agreement. Should a conflict arise, NASA in its sole discretion shall determine whether to exercise that priority. Likewise, should a conflict arise as between two or more non-NASA Partners, NASA, in its sole discretion, shall determine the priority as between those Partners. This Agreement does not obligate NASA to seek alternative government property or services under the jurisdiction of NASA at other locations.

ARTICLE 7. NONEXCLUSIVITY

This Agreement is not exclusive; accordingly, NASA may enter into similar agreements for the same or similar purpose with other private or public entities.

ARTICLE 8. LIABILITY AND RISK OF LOSS

A. Partner waives any claims against NASA, its employees, its related entities, (including, but not limited to, contractors and subcontractors at any tier, grantees, investigators, customers, users, and their contractors and subcontractors, at any tier) and employees of NASA's related entities for any injury to, or death of, Partner employees or the employees of Partner's related entities, or for damage to, or loss of, Partner's property or the property of its related entities arising from or related to activities conducted under this Agreement, whether such injury, death, damage, or loss arises through negligence or otherwise, except in the case of willful misconduct.

B. Partner further agrees to extend this unilateral waiver to its related entities by requiring them, by contract or otherwise, to waive all claims against NASA, its related entities, and employees of NASA and employees of NASA's related entities for injury, death, damage, or loss arising from or related to activities conducted under this Agreement.

ARTICLE 9. LIABILITY AND RISK OF LOSS - PRODUCT LIABILITY

With respect to products or processes resulting from a Party's participation in an SAA, each Party that markets, distributes, or otherwise provides such product, or a product designed or produced by such a process, directly to the public will be solely responsible for the safety of the product or process.

ARTICLE 10. LIABILITY AND RISK OF LOSS - PRODUCT LIABILITY INDEMNIFICATION

In the event the U.S. Government incurs any liability based upon Partner's, or Partner's Related Entity's, use or commercialization of products or processes resulting from a Party's participation under this Agreement, Partner agrees to indemnify and hold the U.S. Government harmless against such liability, including costs and expenses incurred by the U.S. Government in defending against any suit or claim for such liability.

ARTICLE 11. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS

A. General

1. "Related Entity" as used in this Data Rights Article means a contractor, subcontractor, grantee, or other entity having a legal relationship with NASA or Partner that is assigned, tasked, or contracted to perform activities under this Agreement.
2. "Data" means recorded information, regardless of form, the media on which it is recorded, or the method of recording.
3. "Proprietary Data" means Data embodying trade secrets developed at private expense or commercial or financial information that is privileged or confidential, and that includes a restrictive notice, unless the Data is:
 - a. known or available from other sources without restriction;
 - b. known, possessed, or developed independently, and without reference to the Proprietary Data;
 - c. made available by the owners to others without restriction; or
 - d. required by law or court order to be disclosed.
4. Data exchanged under this Agreement is exchanged without restriction except as otherwise provided herein.
5. Notwithstanding any restrictions provided in this Article, the Parties are not restricted in the use, disclosure, or reproduction of Data provided under this Agreement that meets one of the exceptions in 3., above. If a Party believes that any exceptions apply, it shall notify the other Party before any unrestricted use, disclosure, or reproduction of the Data.
6. The Parties will not exchange preexisting Proprietary Data under this Agreement unless authorized herein or in writing by the owner.

7. If the Parties exchange Data having a notice that the Receiving Party deems is ambiguous or unauthorized, the Receiving Party shall tell the Providing Party. If the notice indicates a restriction, the Receiving Party shall protect the Data under this Article unless otherwise directed in writing by the Providing Party.
8. The Data rights herein apply to the employees and Related Entities of Partner. Partner shall ensure that its employees and Related Entity employees know about and are bound by the obligations under this Article.
9. Disclaimer of Liability: NASA is not restricted in, or liable for, the use, disclosure, or reproduction of Data without a restrictive notice or for Data Partner gives, or is required to give, the U.S. Government without restriction.
10. Partner may use the following or a similar restrictive notice :

Proprietary Data Notice

The data herein include Proprietary Data and are restricted under the Data Rights provisions of Space Act Agreement [provide applicable identifying information].

Partner should also mark each page containing Proprietary Data with the following or a similar legend: **“Proprietary Data – Use And Disclose Only Under the Notice on the Title or Cover Page.”**

B. Data First Produced by Partner under this Agreement

If Data first produced by Partner or its Related Entities under this Agreement is given to NASA, and the Data is Proprietary Data, and it includes a restrictive notice, NASA will use reasonable efforts to protect it. The Data will be disclosed and used (under suitable protective conditions) only for U.S. Government purposes.

C. Data First Produced by NASA under this Agreement

If Partner requests that Data first produced by NASA under this Agreement be protected, and NASA determines it would be Proprietary Data if obtained from Partner, NASA will mark it with a restrictive notice and use reasonable efforts to protect it for five (5) years after its development. During this restricted period the Data may be disclosed and used (under suitable protective conditions) for U.S. Government purposes only, and thereafter for any purpose. Partner must not disclose the Data without NASA's written approval during the restricted period. The restrictions placed on NASA do not apply to Data disclosing a NASA owned invention for which patent protection is being considered.

D. Publication of Results

The National Aeronautics and Space Act (51 U.S.C. § 20112) requires NASA to

provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof. As such, NASA may publish unclassified and non-Proprietary Data resulting from work performed under this Agreement. The Parties will coordinate publication of results allowing a reasonable time to review and comment.

E. Data Disclosing an Invention

If the Parties exchange Data disclosing an invention for which patent protection is being considered, and the furnishing Party identifies the Data as such when providing it to the Receiving Party, the Receiving Party shall withhold it from public disclosure for a reasonable time (one (1) year unless otherwise agreed or the Data is restricted for a longer period herein).

F. Copyright

Data exchanged with a copyright notice and with no restrictive notice is presumed to be published. The following royalty-free licenses apply:

1. If indicated on the Data that it was produced outside of this Agreement, it may be reproduced, distributed, and used to prepare derivative works only for carrying out the Receiving Party's responsibilities under this Agreement.

Data without the indication of 1. is presumed to be first produced under this Agreement. Except as otherwise provided in paragraph E. of this Article, and in the Invention and Patent Rights Article of this Agreement for protection of reported inventions, the Data may be reproduced, distributed, and used to prepare derivative works for any purpose.

G. Data Subject to Export Control

Whether or not marked, technical data subject to the export laws and regulations of the United States provided to Partner under this Agreement must not be given to foreign persons or transmitted outside the United States without proper U.S. Government authorization.

H. Handling of Background, Third Party Proprietary, and Controlled Government Data

1. NASA or Partner (as Disclosing Party) may provide the other Party or its Related Entities (as Receiving Party):
 - a. Proprietary Data developed at Disclosing Party's expense outside of this Agreement (referred to as Background Data);
 - b. Proprietary Data of third parties that Disclosing Party has agreed to protect

or is required to protect under the Trade Secrets Act (18 U.S.C. § 1905) (referred to as Third Party Proprietary Data); and

c. U.S. Government Data, including software and related Data, Disclosing Party intends to control (referred to as Controlled Government Data).

2. All Background, Third Party Proprietary and Controlled Government Data provided by Disclosing Party to Receiving Party shall be marked by Disclosing Party with a restrictive notice and protected by Receiving Party in accordance with this Article.

3. Disclosing Party provides the following Data to Receiving Party. The lists below may not be comprehensive, are subject to change, and do not supersede any restrictive notice on the Data.

a. Background Data:

The Disclosing Party's Background Data, if any, will be identified in a separate technical document.

b. Third Party Proprietary Data:

The Disclosing Party's Third Party Proprietary Data, if any, will be identified in a separate technical document.

c. Controlled Government Data:

The Disclosing Party's Controlled Government Data, if any, will be identified in a separate technical document.

NASA software and related Data will be provided to Partner under a separate Software Usage Agreement (SUA). Partner shall use and protect the related Data in accordance with this Article. Unless the SUA authorizes retention, or Partner enters into a license under 37 C.F.R. Part 404, the related Data shall be disposed of as NASA directs:

None

4. For such Data with a restrictive notice pursuant to H.2. or such Data identified in this Article, Receiving Party shall:

a. Use, disclose, or reproduce such Data only as necessary under this Agreement;

b. Safeguard such Data from unauthorized use and disclosure;

c. Allow access to such Data only to its employees and any Related Entity requiring access under this Agreement;

d. Except as otherwise indicated in 4.c., preclude disclosure outside Receiving Party's organization;

e. Notify its employees with access about their obligations under this Article and ensure their compliance, and notify any Related Entity with access about their obligations under this Article; and

f. Dispose of such Data as Disclosing Party directs.

I. Oral and visual information

If Partner discloses Proprietary Data orally or visually, NASA will have no duty to restrict, or liability for disclosure or use, unless Partner:

1. Orally informs NASA before initial disclosure that the Data is Proprietary Data, and
2. Reduces the Data to tangible form with a restrictive and gives it to NASA within ten (10) calendar days after disclosure.

ARTICLE 12. INTELLECTUAL PROPERTY RIGHTS – INVENTION AND PATENT RIGHTS

A. General

1. NASA has determined that 51 U.S.C. § 20135(b) does not apply to this Agreement. Therefore, title to inventions made (conceived or first actually reduced to practice) under this Agreement remain with the respective inventing party(ies). No invention or patent rights are exchanged or granted under this Agreement, except as provided herein.
2. “Related Entity” as used in this Invention and Patent Rights Article means a contractor, subcontractor, grantee, or other entity having a legal relationship with NASA or Partner assigned, tasked, or contracted with to perform activities under this Agreement. The invention and patent rights herein apply to employees and Related Entities of Partner. Partner shall ensure that its employees and Related Entity employees know about and are bound by the obligations under this Article.

B. NASA Inventions

NASA will use reasonable efforts to report inventions made under this Agreement by its employees. Upon request, NASA will use reasonable efforts to grant Partner, under 37 C.F.R. Part 404, a negotiated license to any NASA invention made under this Agreement. This license is subject to paragraph E.1. of this Article.

C. NASA Related Entity Inventions

NASA will use reasonable efforts to report inventions made under this Agreement by its Related Entity employees, or jointly between NASA and Related Entity employees, where NASA has the right to acquire title. Upon request, NASA will use reasonable efforts to grant Partner, under 37 C.F.R. Part 404, a negotiated license to any of these inventions where NASA has acquired title. This license is subject to paragraph E.2. of this Article.

D. Joint Inventions With Partner

The Parties will use reasonable efforts to report, and cooperate in obtaining patent protection on, inventions made jointly between NASA employees, Partner employees, and employees of either Party's Related Entities. Upon timely request, NASA may, at its sole discretion and subject to paragraph E. of this Article:

1. refrain from exercising its undivided interest inconsistently with Partner's commercial business; or
2. use reasonable efforts to grant Partner, under 37 C.F.R. Part 404, an exclusive or partially exclusive negotiated license.

E. Rights to be Reserved in Partner's License

Any license granted Partner under paragraphs B., C., or D. of this Article is subject to the following:

For inventions made solely or jointly by NASA employees, NASA reserves the irrevocable, royalty-free right of the U.S. Government to practice the invention or have it practiced on behalf of the United States or on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

1. For inventions made solely or jointly by employees of a NASA Related Entity, NASA reserves the rights in 1. above, and a revocable, nonexclusive, royalty-free license retained by the Related Entity under 14 C.F.R. § 1245.108 or 37 C.F.R. § 401.14 (e).

F. Protection of Reported Inventions

For inventions reported under this Article, the Receiving Party shall withhold all invention reports or disclosures from public access for a reasonable time (1 year unless otherwise agreed or unless restricted longer herein) to facilitate establishment of patent rights.

G. Patent Filing Responsibilities and Costs

1. The invention and patent rights herein apply to any patent application or patents covering an invention made under this Agreement. Each Party is responsible for its own costs of obtaining and maintaining patents covering sole inventions of its employees. The Parties may agree otherwise, upon the reporting of any invention (sole or joint) or in any license granted.
2. Partner shall include the following in patent applications for an invention made jointly between NASA employees, its Related Entity employees and Partner employees:

The invention described herein may be manufactured and used by or for the

**U.S. Government for U.S. Government purposes
without the payment of royalties thereon or therefore.**

NASA technology available for licensing can be located by visiting the following website address – <http://technology.nasa.gov>.

ARTICLE 13. USE OF NASA NAME AND NASA EMBLEMS

A. NASA Name and Initials

Partner shall not use “National Aeronautics and Space Administration” or “NASA” in a way that creates the impression that a product or service has the authorization, support, sponsorship, or endorsement of NASA, which does not, in fact, exist. Except for releases under the “Release of General Information to the Public and Media” Article, Partner must submit any proposed public use of the NASA name or initials (including press releases and all promotional and advertising use) to the NASA Associate Administrator for the Office of Communications or designee (“NASA Communications”) for review and approval. Approval by NASA Office of Communications shall be based on applicable law and policy governing the use of the NASA name and initials.

B. NASA Emblems

Use of NASA emblems (*i.e.*, NASA Seal, NASA Insignia, NASA logotype, NASA Program Identifiers, and the NASA Flag) is governed by 14 C.F.R. Part 1221. Partner must submit any proposed use of the emblems to NASA Communications for review and approval.

ARTICLE 14. RELEASE OF GENERAL INFORMATION TO THE PUBLIC AND MEDIA

NASA or Partner may, consistent with Federal law and this Agreement, release general information regarding its own participation in this Agreement as desired.

Pursuant to Section 841(d) of the NASA Transition Authorization Act of 2017, Public Law 115-10 (the “NTAA”), NASA is obligated to publicly disclose copies of all agreements conducted pursuant to NASA’s 51 U.S.C. §20113(e) authority in a searchable format on the NASA website within 60 days after the agreement is signed by the Parties. The Parties acknowledge that a copy of this Agreement will be disclosed, without redactions, in accordance with the NTAA.

ARTICLE 15. DISCLAIMER OF WARRANTY

Goods, services, facilities, or equipment provided by NASA under this Agreement are provided “as is.” NASA makes no express or implied warranty as to the condition of any such goods, services, facilities, or equipment, or as to the condition of any research or information generated under this Agreement, or as to any products made or developed under or as a result of this Agreement including as a result of the use of information generated hereunder, or as to the merchantability or fitness for a particular purpose of such research, information, or resulting product, or that the goods, services, facilities or equipment provided will accomplish the intended results or are safe for any purpose including the intended purpose, or that any of the above will not interfere with privately-owned rights of others. Neither the government nor its contractors shall be liable for special, consequential or incidental damages attributed to such equipment, facilities, technical information, or services provided under this Agreement or such research, information, or resulting products made or developed under or as a result of this Agreement.

ARTICLE 16. DISCLAIMER OF ENDORSEMENT

NASA does not endorse or sponsor any commercial product, service, or activity. NASA’s participation in this Agreement or provision of goods, services, facilities or equipment under this Agreement does not constitute endorsement by NASA. Partner agrees that nothing in this Agreement will be construed to imply that NASA authorizes, supports, endorses, or sponsors any product or service of Partner resulting from activities conducted under this Agreement, regardless of the fact that such product or service may employ NASA-developed technology.

ARTICLE 17. COMPLIANCE WITH LAWS AND REGULATIONS

A. The Parties shall comply with all applicable laws and regulations including, but not limited to, safety; security; export control; environmental; and suspension and debarment laws and regulations. Access by a Partner to NASA facilities or property, or to a NASA Information Technology (IT) system or application, is contingent upon compliance with NASA security and safety policies and guidelines including, but not limited to, standards on badging, credentials, and facility and IT system/application access.

B. With respect to any export control requirements:

1. The Parties will comply with all U.S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR), 22 C.F.R. Parts 120 through 130, and the Export Administration Regulations (EAR), 15 C.F.R. Parts 730 through 799, in performing work under this Agreement or any Annex to this Agreement. In the absence of available license exemptions or exceptions, the Partner shall be responsible for obtaining the appropriate licenses or other approvals, if required, for exports of hardware, technical data and software, or for the provision of technical

assistance.

2. The Partner shall be responsible for obtaining export licenses, if required, before utilizing foreign persons in the performance of work under this Agreement or any Annex under this Agreement, including instances where the work is to be performed on-site at NASA and where the foreign person will have access to export-controlled technical data or software.

3. The Partner will be responsible for all regulatory record-keeping requirements associated with the use of licenses and license exemptions or exceptions. The Partner will be responsible for ensuring that the provisions of this Article apply to its Related Entities.

C. With respect to suspension and debarment requirements:

1. The Partner hereby certifies, to the best of its knowledge and belief, that it has complied, and shall comply, with 2 C.F.R. Part 180, Subpart C, as supplemented by 2 C.F.R. Part 1880, Subpart C.

2. The Partner shall include language and requirements equivalent to those set forth in subparagraph C.1., above, in any lower-tier covered transaction entered into under this Agreement.

ARTICLE 18. TERM OF AGREEMENT

This Agreement becomes effective upon the date of the last signature below ("Effective Date") and shall remain in effect until the completion of all obligations of both Parties hereto, or two years from the Effective Date, whichever comes first.

ARTICLE 19. RIGHT TO TERMINATE

Either Party may unilaterally terminate this Agreement by providing thirty (30) calendar days written notice to the other Party.

ARTICLE 20. CONTINUING OBLIGATIONS

The rights and obligations of the Parties that, by their nature, would continue beyond the expiration or termination of this Agreement, e.g., "Liability and Risk of Loss" and "Intellectual Property Rights" related clauses shall survive such expiration or termination of this Agreement.

ARTICLE 21. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the

Parties in the performance of this Agreement.

Technical Points of Contact

NASA	GLOYER-TAYLOR LABORATORIES, LLC
NAME	Joshua Batterson
ADDRESS	112 Mitchell Blvd, Tullahoma, TN 37388
PHONE	931-455-7333
FAX	N/A
EMAIL	Josh.Batterson@gtlcompany.com

ARTICLE 22. DISPUTE RESOLUTION

Except as otherwise provided in the Article entitled "Priority of Use," the Article entitled "Intellectual Property Rights – Invention and Patent Rights" (for those activities governed by 37 C.F.R. Part 404), and those situations where a pre-existing statutory or regulatory system exists (e.g., under the Freedom of Information Act, 5 U.S.C. § 552), all disputes concerning questions of fact or law arising under this Agreement shall be referred by the claimant in writing to the appropriate person identified in this Agreement as the "Points of Contact." The persons identified as the "Points of Contact" for NASA and the Partner will consult and attempt to resolve all issues arising from the implementation of this Agreement. If they are unable to come to agreement on any issue, the dispute will be referred to the signatories to this Agreement, or their designees, for joint resolution. If the Parties remain unable to resolve the dispute, then the NASA signatory or that person's designee, as applicable, will issue a written decision that will be the final agency decision for the purpose of judicial review. Nothing in this Article limits or prevents either Party from pursuing any other right or remedy available by law upon the issuance of the final agency decision.

ARTICLE 23. MODIFICATIONS

Any modification to this Agreement shall be executed, in writing, and signed by an authorized representative of NASA and the Partner.

ARTICLE 24. ASSIGNMENT

Neither this Agreement nor any interest arising under it will be assigned by the Partner or NASA without the express written consent of the officials executing, or successors, or higher-level officials possessing original or delegated authority to execute this Agreement.

ARTICLE 25. APPLICABLE LAW

U.S. Federal law governs this Agreement for all purposes, including, but not limited to, determining the validity of the Agreement, the meaning of its

provisions, and the rights, obligations and remedies of the Parties.

ARTICLE 26. INDEPENDENT RELATIONSHIP

This Agreement is not intended to constitute, create, give effect to or otherwise recognize a joint venture, partnership, or formal business organization, or agency agreement of any kind, and the rights and obligations of the Parties shall be only those expressly set forth herein.

ARTICLE 27. LOAN OF GOVERNMENT PROPERTY

The parties shall enter into a NASA Form 893, Loan of NASA Equipment, for NASA equipment loaned to Partner.


ARTICLE 28. SIGNATORY AUTHORITY

The signatories to this Agreement covenant and warrant that they have authority to execute this Agreement. By signing below, the undersigned agrees to the above terms and conditions.

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION

GLOYER-TAYLOR LABORATORIES,
LLC

BY: _____
James L. Reuter
Associate Administrator, STMD

BY:  _____
Paul Gloyer
President

DATE: _____

DATE: 6/19/2020

THE RESPONSIBILITIES AND SCHEDULE DOCUMENT IS REQUIRED TO BE INCLUDED AS AN ATTACHMENT TO THE CENTER LETTER OF INTENT SUPPORTING THE PROPOSAL. SUBMISSION OF A CENTER LETTER OF INTENT AND RESPONSIBILITY AND SCHEDULE DOCUMENT IN A FINAL ACO PROPOSAL INDICATES PROPOSER'S ACCEPTANCE OF THE RESPONSIBILITIES AND SCHEDULE DOCUMENT PROPOSED BY THE CENTER IF SELECTED FOR AWARD.

PURSUANT TO ARTICLE 2 OF THE TEMPLATE SPACE ACT AGREEMENT, THE RESPONSIBILITIES AND SCHEDULE DOCUMENT IS INCORPORATED FULLY BY REFERENCE INTO THE SPACE ACT AGREEMENT AND THEREFORE WILL BE PUBLISHED WITH THE SPACE ACT AGREEMENT IN ACCORDANCE WITH ARTICLE 16 OF THE SPACE ACT AGREEMENT.

RESPONSIBILITIES AND SCHEDULE
DEVELOPED BY **MSFC**
TO SUPPORT ACO 2020 PROPOSAL SUBMITTED BY
Gloyer-Taylor Laboratories, LLC.

1. RESPONSIBILITIES

A. **MSFC** will use reasonable efforts to:

1. Perform an end-to-end analysis using the UCDS/SimDAT software on demonstration cases, including a NASA-selected case, providing a gentle learning curve and the demonstration of modeling capabilities in a simulated operational environment.
2. Provide experience-based feedback for software direction and improvement.

B. **Gloyer-Taylor Laboratories, LLC.** will use reasonable efforts to:

1. Prepare relevant demonstration cases having increasing model sophistication that provide introduction to the UCDS/SimDAT software capability.
2. Package and provide UCDS/SimDAT software for evaluation.
3. Produce UCDS/SimDAT software documentation and provide training.

Task Description

Task 1 - Demonstration Cases	Prepare relevant demonstration cases having increasing model sophistication that provide introduction to the UCDS/SimDAT software capability.
Task Description	The goal is to establish several relevant cases with increasing modeling sophistication that provide an easy introduction and gentle learning curve. A final, "industry" case is included to apply the software to a problem-of-interest selected by MSFC. This is a current or recent system with supporting experimental data to verify predictive capabilities by an independent, third-party with minimal direct input from GTL. Simulations of this case have not been performed previously so this final problem will provide the most impactful demonstration and validation of the UCDS/SimDAT software. Each of the selected models demonstrates a physical process found in unstable propulsion systems.
Task 2 - Package Software	Package and provide UCDS/SimDAT software for evaluation
Task Description	GTL shall package and provide the software to MSFC for evaluation. Feedback may be solicited to better understand MSFC's computing resources so that package dependencies can be accounted before delivery.
Task 3 - Produce Documentation and Provide Training	Produce UCDS/SimDAT software documentation and provide training.
Task Description	GTL shall complete user documentation, training documentation, and maintenance documentation to be delivered to MSFC with the software. This allows MSFC personnel to explore the software at their convenience as well as to meet exit criteria for TRL 8. As part of this task GTL shall also provide training to MSFC.
Task 4 - Perform End-to-End Analysis of Demonstration Cases	Perform an end-to-end analysis using the UCDS/SimDAT software on demonstration cases, including a NASA-selected case, providing a gentle learning curve and the demonstration of modeling capabilities in a simulated operational environment.
Task Description	MSFC shall complete an analysis for each of the demonstration cases. This task is intended to facilitate feedback that supports future development and higher TRL. Successfully completing this task would demonstrate modeling capabilities in a simulated operational environment, such as linearized acoustics, nonlinear acoustics, compressible CFD, quantify acoustic driving/damping and mode shapes, incorporating mean flow, and chemical kinetics.
Demonstration Cases	<p>1) <u>Piston shock tube</u>: This is a well-controlled nonlinear acoustic device where an oscillating boundary drives steep-fronted, longitudinal acoustic waves. It is a representative example of an instability found in slender rocket motors and is used to explore unstable acoustic waves, harmonics, and driving and damping mechanisms.</p> <p>2) <u>NACA acoustic cavity</u>: This models flow over a cavity in a transonic wind tunnel. This example illustrates vortex-generated sound sources and vortex synchronization.</p> <p>3) <u>AFRL "Volvo" flame holder</u>: This models a well-controlled propane/air combustor that is known to exhibit combustion instabilities.</p> <p>4) <u>Convective heating</u>: This model demonstrates multiphysics conjugate heat transfer modeling. This approach solves both the fluid and solid domain simultaneously and resolves energy transfer between both without requiring empirical convection coefficients.</p> <p>5) <u>Peregrine solid rocket</u>: This motor is a NASA design that exhibited a low limit cycle amplitude. The model would include unsteady solid propellant burning and acoustic coupling with limit cycle behavior. This example is of relevance because it illustrates practical physical models relevant to combustion instability.</p>
Task 5 - Provide Feedback	Provide experience-based feedback for software direction and improvement.
Task Description	MSFC shall provide feedback including, but not limited to in installation requirements/issues, end-user experience, relevance to future need, improvements/bug reports, and capabilities to include in future releases. This provides value and direction for this software to better meet market need. This task begins early in the effort and continues through each major milestone as appropriate.

2. SCHEDULE

The planned schedule for the activities with Gloyer-Taylor Laboratories, LLC. as defined in Paragraph 1. RESPONSIBILITIES are as follows:

Month (ATP +)	1	2	3	4	5	6	7	8	9	10	11	12
Task 1 – Demonstration Cases		▲										
Task 2 – Package Software												
Task 3 – Documentation		▲										
Task 4 – End-to-End Demonstration												
Piston Shock Tube				▲								
NACA Acoustic Cavity						▲						
AFRL “Volvo” Flameholder							▲					
Convective Heating									▲			
Peregrine SRM												▲
Task 5 – Provide Feedback												▲
Program Management												
Meetings*												
Reports												

Quarterly meetings are scheduled to coincide with the completion of two demonstration cases with the last quarter solely dedicated to the final case. However, scheduled meetings may change to support evaluation efforts and additional training needs. Successfully completing each case represents a major milestone and significant technical achievement culminating with the final report.

3. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Agreement.

Marshall Space Flight Center

Matthew J. Casiano
Mailstop ER42
Huntsville AL, 35802
Phone: 256-544-6057
Fax: None
matthew.j.casiano@nasa.gov

Gloyer-Taylor Laboratories, LLC.

Joshua W. Batterson
112 Mitchell Blvd
Tullahoma, TN 37388
Phone: 931-455-7330 x1804
Fax: 931-913-0136
josh.batterson@gtlcompany.com

4. MODIFICATIONS

Any modification to this Responsibilities and Schedule document set forth herein after award shall be documented in writing, and signed by both the NASA MSFC and the Gloyer-Taylor Laboratories, LLC. Modification of this Responsibilities and Schedule document does not modify the terms of the Space Act Agreement.

5. SIGNATORY AUTHORITY

The signatory to this Responsibilities and Schedule document represents and warrants that he/she has authority to commit NASA MSFC to support Gloyer-Taylor Laboratories, LLC. if selected for award.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Marshall Space Flight Center

BY: **RAE MEYER**
Digitally signed by RAE MEYER
Date: 2020.10.14 17:27:01 -05'00'

Rae Ann Meyer
Director, Science and Technology